

Health & Safety

Report

Worker Health and Safety Branch

HS-1845

Assessing Pesticide-Related Illnesses/Injuries Among California Fieldworkers Performing Irrigation Tasks

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Executive Summary

Preliminary information obtained during Worker Health & Safety's (WH&S) analysis of compliance with field posting requirements indicated that fieldworkers performing irrigation tasks (irrigators) may be at greater risk of pesticide exposure than fieldworkers performing other tasks (1). Between 1995-2000, 7% of fieldworker illnesses/injuries categorized as either definitely, probably or possibly related to a pesticide exposure involved irrigators (2). Irrigators are frequently the first fieldworkers to enter a field after a pesticide application, and are often early entry workers. Early entry, as defined in regulation, means entry into a treated field or other area after the pesticide application is complete, but before the restricted entry interval (REI) or other restrictions on entry for that pesticide have expired (3). Based on the type of irrigation task they are performing, an irrigator can spend anywhere from a maximum of one to eight hours per 24 hours in a field with an REI in effect. Since working in the field during an REI offers a greater potential for pesticide exposure than fieldwork after expiration of an REI, WH&S has initiated a three-part project to assess irrigators' risk of pesticide exposure. First, WH&S staff have begun a field study wherein staff members are observing irrigators at work, recording the specific types of tasks, and time spent on each task. Second, WH&S staff will conduct a field study to monitor dermal exposure of cotton irrigators in both furrow and hand-moved sprinkler systems. The third part of the project is this report, which examines data from the Department of Pesticide Regulation's Pesticide Illness Surveillance Program (PISP) database to determine if the nature of irrigators' tasks leads them to be particularly vulnerable to pesticide illness/injury.

WH&S evaluated PISP data on pesticide-related illness/injury episodes for irrigators for the years 1995-2000. A total of 88 episodes were evaluated for compliance with notification and posting requirements, number and types of early entry activities, and the crops and pesticides reported in the episode investigations. The episodes that were not classified as early entry were further subdivided into a number of categories.

Early entry tasks were identified in 26 of the episodes. The number of early entry episodes has shown an overall decline for the years reviewed. Two issues, notification and compliance with personal protective equipment (PPE) requirements, stand out as particularly needing attention. No particular crop/chemical combinations were frequently associated with the early entry episodes.

The remaining 62 episodes were divided into the following categories: episodes where irrigator(s) worked only on the periphery of treated fields; episodes where the pesticide was applied to a field other than the one occupied by the irrigator (not including drift); drift episodes; episodes where irrigator(s) were in the treated area during the application; episodes categorized as accidental; and episodes with irrigators who entered fields after the expiration of the REI.

Irrigators generally work only on the periphery of fields when performing flood or furrow irrigation so they would presumably not contact treated foliage. A possible route of exposure in these cases may be through contact with irrigation equipment if it was in the field at the time of the pesticide application. In the episodes where the irrigator(s)

reported that they had not entered the field, a rash was the most commonly reported symptom. The fact that irrigators are often working in wet conditions day after day offers another explanation, besides pesticide exposure, for the rate of reported rashes among irrigators. According to Held, *et. al.*, skin diseases make up as much as 30% of all occupational diseases which are eligible for compensation, and employees in wet occupations are at increased risk of developing irritant skin reactions (8).

All of the episodes where the REI had expired by the time irrigator(s) entered the field to work were classified by WH&S as possibly related to a pesticide exposure. Again, a rash was the symptom most commonly reported. No particular crop-chemical combinations can be identified for these episodes, as more than 27 different pesticides were used on the 17 crops in these episodes. Due to either incomplete information and/or non-specific symptoms, 82% of the episodes identified as other than early entry were classified as only possibly related to a pesticide exposure, making it difficult to evaluate specific problems for these episodes.

WH&S's analysis of 1995-2000 pesticide-related illness/injury episodes for irrigators indicates that our focus needs to be on obtaining greater compliance with notification and PPE requirements.

In late 2002, WH&S began the process of drafting changes to Title 3 California Code of Regulations, Sections 6618 and 6619 (notification requirements), and Section 6771 (requirements for early entry workers). In Section 6771, employers are required to inform early-entry workers of the "need for and care of personal protective equipment". The proposed changes are based partly on an analysis of PISP data (McCarthy, 2002) that assessed compliance with notification requirements for fieldworkers (10). Additionally, WH&S determined the need to clarify certain parts of existing regulations. During the preliminary stages of the rulemaking process, WH&S staff have relied upon input from worker advocates, County Agricultural Commissioners (CAC), growers and commercial applicators from throughout California. DPR's Enforcement Branch is also paying increased attention to monitoring compliance with notification requirements. In 2003, the Enforcement Branch amended its fieldworker inspection form to include evaluation of compliance with notification requirements, and CACs are including this as a focused activity in their 2003/2004 negotiated workplans with DPR.

- 2003: WH&S will add early entry irrigators to the 2003 WH&S illness investigation priority list.
- 2003: WH&S will initiate a dermal exposure monitoring study of cotton irrigators in both furrow and hand-moved sprinkler systems.
- 2004: WH&S will place special emphasis on evaluating PISP investigative reports involving early entry violations to ascertain the level of compliance with notification requirements. If necessary, WH&S will work with Enforcement Branch to offer training to county agricultural commissioner's staff emphasizing the importance of complying with notification requirements.

- **Acronym Glossary**

3 CCR	California Code of Regulations, Title 3, Division 6
CAC	County Agricultural Commissioner, DPR's local enforcement arm
DPR	California Environmental Protection Agency, Department of Pesticide Regulation
PISP	California Department of Pesticide Regulation, Worker Health and Safety Branch, Pesticide Illness Surveillance Program
PPE	Personal Protective Equipment
REI	Restricted Entry Interval
WH&S	Department of Pesticide Regulation, Worker Health and Safety Branch
WPS	Worker Protection Standard

Introduction

Preliminary information obtained during Worker Health & Safety's (WH&S) analysis of compliance with field posting requirements indicated that fieldworkers performing irrigation tasks (irrigators) may be at greater risk of pesticide exposure than fieldworkers performing other tasks (Spencer, 2001) (1). Between 1995-2000, 7% of fieldworker injury/illness episodes categorized as either definitely, probably or possibly related to a pesticide exposure were episodes involving irrigators (2). Irrigators are frequently the first fieldworkers to enter a field after a pesticide application and are often early entry workers. Early entry, as defined in regulation, means entry into a treated field or other area after the pesticide application is complete, but before the restricted entry interval (REI) or other restrictions on entry for that pesticide have expired (3). Based on the type of irrigation task they are performing, irrigators can spend anywhere from a maximum of one to eight hours per 24 hour period in a field with an REI in effect (see Table 1). Since working in the field during an REI offers a greater potential for pesticide exposure than fieldwork after expiration of an REI, WH&S has initiated a three-part project to assess irrigator's risk of pesticide exposure. First, WH&S staff have begun a field study wherein staff members are observing irrigators at work, recording the specific types of tasks, and time spent on each task. Second, WH&S staff will conduct a field study to monitor dermal exposure of cotton irrigators in both furrow and hand-moved sprinkler systems. The third part of the project is this report, which summarizes California regulations governing early entry activities, and examines data from the Pesticide Illness Surveillance Program (PISP) database to determine if the nature of irrigator's tasks leads them to be particularly vulnerable to pesticide illness/injury.

California regulations governing early entry activities were amended with the incorporation of the Worker Protection Standard (WPS) into Title 3 California Code of Regulations (3 CCR) in 1997 (4,5). Prior to 1997, early entry workers were allowed to enter the field after the "spray has dried, dust has settled". This type of REI no longer exists. Since 1997, all early entry workers, with the exception of handlers and those who would have no contact with any treated surface, are not allowed to enter the field until at

least four hours after the pesticide application. Another change in the regulations was the division of early entry activities into the following: pesticide handlers, ‘no contact’ activities, ‘limited contact’ activities, and ‘other’ activities (not involving hand labor). The maximum amount of time workers engaged in ‘low contact’ or ‘other’ activities spend in a field with an REI in effect is now limited to 8 hours and 1 hour respectively (prior to 1997, regulations did not limit the time spent in the field during an REI). In addition, if the REI is for a pesticide with the label requirement for both oral notification and posting (dual notification), workers who would be performing ‘low contact’ activities are not allowed to enter the field (6). Table 1 provides a list of the types of activities permitted by regulation during an REI and the restrictions associated with each activity.

Table 1: California Regulations Governing Early Entry Activities¹

Who is allowed to enter field while a Restricted Entry Interval (REI) is in effect?	Restrictions
Employees conducting pesticide handling activities, including soil incorporation (mechanical or watered-in)	Must wear personal protective equipment (PPE) required on the pesticide label for handling activities
Employees involved in activities in which there will be no contact with anything that has been treated (e.g. operating a tractor from an enclosed cab)	Inhalation exposure does not exceed any pesticide product labeling standard or, for greenhouses, the ventilation criteria in 3 CCR ¹ , Section 6769, have been met
Employees involved in limited contact activity(s) (including limited contact irrigation) that are necessary and unforeseen	<ol style="list-style-type: none"> 1. The REI is not for a pesticide with the label requirement for both oral notification and posting 2. At least 4 hours have elapsed since the end of the application 3. Inhalation exposure does not exceed the pesticide product labeling standard or the ventilation criteria in 3 CCR, Section 6769, have been met 4. Exposure is minimal and limited to the feet, legs (below the knees), hands, and forearms (below the elbows) 5. The PPE specified on the pesticide label for early entry or the optional personal protective equipment of coveralls, socks, chemical resistant footwear, chemical resistant gloves, and protective eyewear (if required by the pesticide label) is utilized 6. The time in treated fields under a REI does not exceed 8 hours in any 24-hour period 7. The employees are informed that this exception is being used and about the provisions of 2, 3, and 6.
Employees involved in other activities not included above, and that do not involve hand labor	<ol style="list-style-type: none"> 1. At least 4 hours have elapsed since the end of the application 2. Inhalation exposure does not exceed the pesticide product labeling standard or the ventilation criteria in 3 CCR, Section 6769, have been met 3. The PPE specified on the pesticide label for early entry is used 4. Entry does not exceed one hour in any 24-hour period

¹Title 3 California Code of Regulations

WH&S’s PISP maintains a database of pesticide-related injuries and illnesses. PISP data are compiled from physician reports and Worker’s Compensation Records. After a pesticide-related illness or injury is reported, the local county agricultural commissioner

(CAC) investigates and reports on the circumstances of exposure. Based on these reports, WH&S staff characterize the degree of correlation between a pesticide exposure and reported illnesses/injuries as per Table 2. Exposures such as eye injuries are more easily attributable to a specific cause than more general symptoms such as rash, nausea, or headache. Rashes are one of the most difficult symptoms to classify as to relationship to exposure since there are many potential causes in addition to pesticide exposure. The elapsed time between the date of the exposure and the date of the investigation also may affect the classification process, since it would affect the ability to collect residue samples in some cases, or to interview the affected employee (agricultural workers often move from farm to farm). Episodes classified as ‘possibly’ related to a pesticide exposure may be missing key physical evidence, such as a depressed cholinesterase level or residue samples, and the investigative report is often sketchy because of the amount of time elapsed between the alleged exposure and the date of the investigation.

Table 2: Degree of Correlation Between Pesticide Exposure and Resulting Symptomatology (9)

Relationship	Definition
Definite	High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.
Probable	Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.
Possible	Some degree of correlation evident. Medical and physical evidence are inconclusive or unavailable.
Unlikely	A correlation cannot be ruled out absolutely. Medical and/or physical evidence suggest a cause other than pesticide exposure.
Indirect	Pesticide exposure is not responsible, but pesticide regulations or product label contributed in some way (e.g. heat stress while wearing chemical resistant clothing).
Asymptomatic	Exposure occurred, but did not result in illness/injury. Cholinesterase depression without symptoms fall in this category.
Unrelated	Definite evidence of cause other than pesticide exposure including exposures to chemicals other than pesticides
Not Applicable	Relationship cannot be established because the necessary information is either unavailable or not provided.

California Department of Pesticide Regulation (2002) Pesticide Illness Surveillance Program (PISP) Database User Documentation/Dictionary

Methods

All 1995-2000 irrigator pesticide-related injury/illness cases in the PISP database for which an injury/illness was classified as definitely, probably or possibly related to a pesticide exposure were analyzed for this report. A PISP case number is assigned for each person exposed to one or more pesticides. For the purposes of this report, an illness episode refers to a one-time pesticide exposure. An episode can involve a single person or several people. When more than one person is involved in an episode, WH&S staff evaluate each investigative report for a pesticide incident separately and may assign different degrees of correlation between the pesticide exposure and resulting symptomatology for the workers. For instance, an exposure incident involving three workers generates three PISP case reports, one of which may be classified as 'probably' related, and the remaining two classified as 'possibly' related to the exposure. For this report, *episodes* were classified as definitely, probably, or possibly related based on the most restrictive case report for that incident. After analyzing the investigative reports, the episodes were further separated into 'early entry' or 'other'. For instance, if irrigators were actually in the field when an application started, this would be classified as 'other' rather than 'early entry', unless the workers left the field and re-entered it while the REI was still in effect.

Results

From 1995-2000, there were 88 pesticide-related injury/illness episodes involving a total of 106 irrigators (see Chart 1 for episodes, and 1(a) for number(s) of irrigators). With the exception of 1998 (see Chart 2 for further explanation), the total number of incidents/year showed a rapid decline during this time period. In 1995, there were 24 pesticide-related injury/illness episodes involving irrigators. By 1999, there were only 5, and in 2000 there were 9. During this period, 26 episodes were classified as early entry. Sixteen of the early entry episodes occurred prior to 1997. The number of early entry episodes declined from 8 per year in 1995 and 1996 to 2 per year in 1997, 1998 and 1999. In 2000 there were 3 early entry episodes. Sixty-two of the episodes (70%) were identified as other than early entry. In 1998 these 'other' episodes accounted for 85% of the total for the year. The data for individual irrigator cases looks quite similar since 77 episodes involved 1 irrigator each. For the remaining episodes, one involved 4 irrigators, five episodes involved 3 irrigators each, and five episodes involved 2 irrigators each.

Chart 1: 1995-2000 Pesticide-Related Illness/Injury Episodes Per Year Involving Irrigators

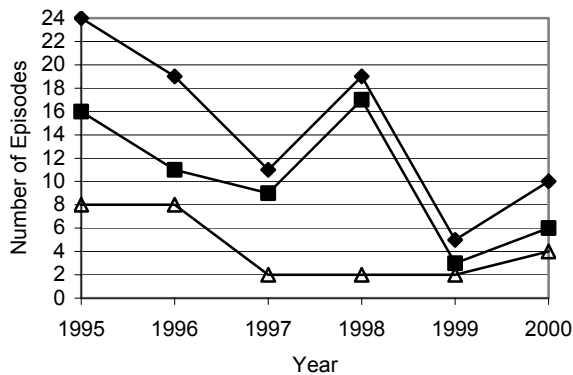
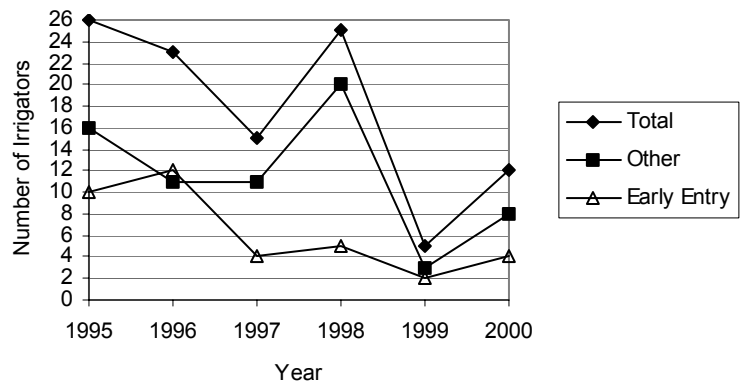


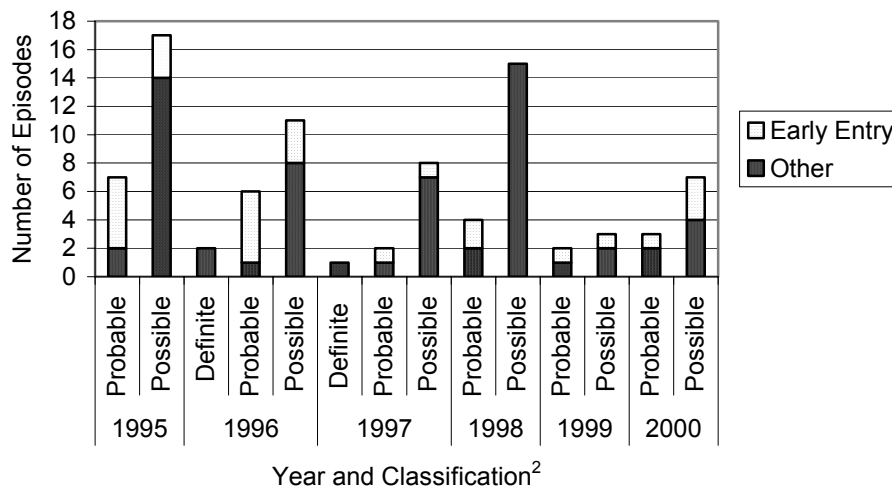
Chart 1(a): 1995-2000 Number of Irrigators Per Year Reporting Pesticide Related Illness/Injuries



California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

Chart 2 depicts all the pesticide-related illness/injuries episodes for irrigators from 1995-2000, classified as definitely, probably or possibly related to a pesticide exposure. During this six-year period, 3 episodes (2 in 1996, one in 1997) were classified as definitely related to a pesticide exposure. None of these three were classified as early entry. Twenty-three episodes (27%) were classified as probably related and 62 (70%) were classified as possibly related. It should be noted that the spike in the number of incidents for 1998 is due to the increase in those episodes classified as possibly related to an exposure. Only 4 episodes in 1998 were classified as probably related, while 15 episodes were classified as possibly related. For early entry episodes during this six-year period, 15 were classified as probably related to a pesticide exposure and 11 were classified as possibly related. For episodes classified as other than early entry, 8 were classified as probably related and 51 episodes were classified as possibly related.

Chart 2: 1995-2000 Pesticide-Related Injury/Illness Episodes per Year Involving Irrigators, Classified by Time of Entry and Relationship to Pesticide Exposure¹



¹California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

²Definite - High degree of correlation between pattern of exposure and resulting symptomatology. Requires both medical evidence (such as measured cholinesterase inhibition, positive allergy tests, characteristic signs observed by medical professional) and physical evidence of exposure (environmental and/or biological samples, exposure history) to support the conclusions.

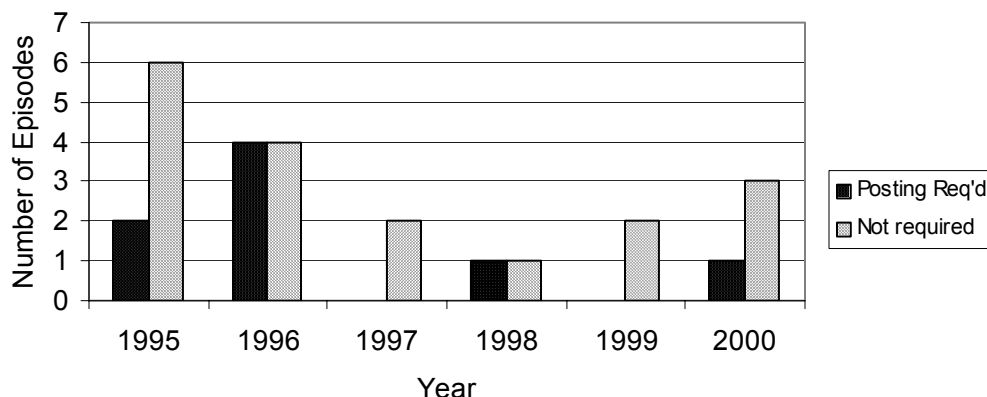
Probable - Relatively high degree of correlation exists between the pattern of exposure and the resulting symptomatology. Either medical or physical evidence is inconclusive or unavailable.

Possible - Some degree of correlation evident. Medical and physical evidence are inconclusive or unavailable.

Early entry episodes

Since 1997, California regulations have prohibited employees from entering a field to perform limited contact activities if there is an REI in effect for a pesticide product with the **label requirement** for both oral notification and posting. Chart 3 compares those irrigator early entry episodes from 1995 through 2000 with label-required posting to those where no posting was required. Eight episodes since 1995 have occurred in fields where posting was required, however, only two of these occurred post-1997. The irrigator in the 1998 episode was performing a high contact activity in a posted field, which is allowed, but he was in the field for three hours (two hours longer than allowed for high contact). In the 2000 episode, the irrigator was actually in the unposted field when the application began. He was sprayed twice, left the field to go home, shower and change clothes. He then returned and drove a tractor in the treated field.

Chart 3: 1995-2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators, Classified as Early Entry, with Label Required Posting¹

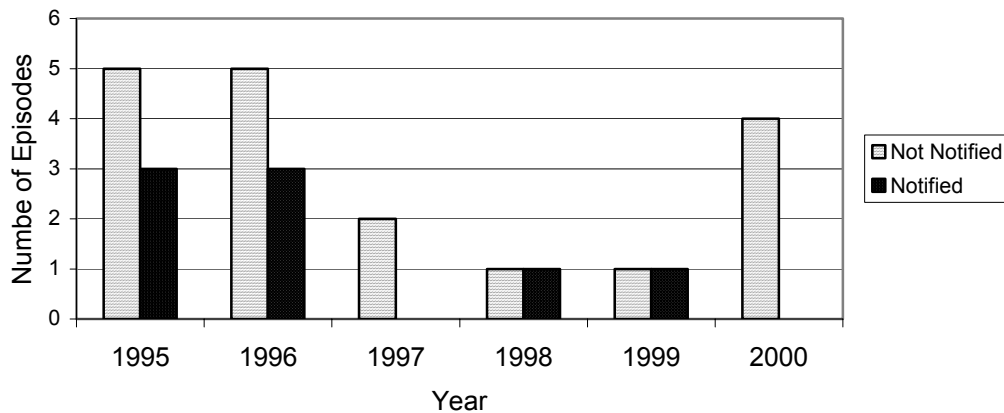


¹California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

Two episodes (one in 1998, one in 2000) were in Monterey County where every REI ≥ 24 hours requires posting. One episode in 1999 occurred in a greenhouse (California regulations require posting for all pesticide applications in greenhouses). Because the posting for these applications was not 'label-required' posting, these three episodes were placed in the 'not required' category in this chart.

According to 3 CCR, Section 6618, agricultural employers must give the following information to any employee(s) who may enter or walk within $\frac{1}{4}$ mile of the field during the application or the REI: location and description of the treated area, the time during which entry is restricted, and instructions not to enter the treated field, except as provided in Section 6770, until the restricted entry interval has expired. Therefore, in the episodes described in this report, an employee is considered notified only if his employer has met all the requirements in Sections 6618 and 6770. For instance, if the employee was told that an REI was in effect but not told of PPE requirements or that he must limit his time in the field, that episode would be listed in the 'not notified' category. The notification data for the irrigator early entry episodes is presented in Chart 4. It is clear from these data that lack of notification is a significant problem for early entry irrigators. In 18 of the 26 early entry episodes, the irrigator(s) were not notified. Since 1997 irrigators were not notified in eight out of ten early entry episodes.

Chart 4: 1995–2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators, Classified as Early Entry, and Compliance with Notification Requirements



California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

Table 3 lists the twenty-six irrigator episodes identified as early entry and the following details about each episode: crop, pesticide, restricted entry interval (REI) and posting requirements, description of the exposure, whether or not the worker was interviewed during the investigation, if the worker was notified, label-required PPE, and what types of PPE or clothing were worn by the irrigator. The lack of compliance with PPE requirements for early entry workers particularly stands out in this table. Line 9 describes the only early entry episode where there were no PPE or other violations. In **none** of the other episodes were the irrigator(s) wearing all of the PPE required for early entry. In 18 of the episodes the irrigator(s) were neither notified nor wearing the required PPE. Although the irrigator(s) were notified in the other eight episodes, they were wearing either none or only some of the required PPE. Many of the episodes involved other violations as well. For instance, in the episode on line 19, the irrigator was in the field for three hours performing a high contact activity (high contact activities during an REI are limited to one hour). In the episode described on line 25, not only was the irrigator not notified and not wearing required PPE, but he also spent 11.5 hours in the field. Some episodes particularly highlight the need for better notification and training. In two episodes (lines 18 and 23), the irrigators were actually in the field when an application began. In both cases the irrigators went home, showered, changed, came back and reentered the treated field without wearing the required PPE.

Table 3: 1995–2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators,
Classified as Early Entry, with Details from Investigative Report¹

Line Number	Year	Crop	Pesticide (REI ² , Posting ³)	Hours Spent in Field	Description of Exposure	Worker Interviewed?	Worker Notified?	Label Required PPE ⁴	PPE/Clothing Worn by Irrigator(s)
1	1995	Broccoli	Chlorpyrifos, Chlorthal dimethyl, Diazinon, Fenamiphos (48 hours)	<1	Entered field 24 hours after an application to close an underground gate, detected an odor. Employer stated that he told irrigator not to enter field, irrigator says he saw application but wasn't told to stay out. Symptoms: fatigue, sleepiness, numb tongue	Yes	No	Ch, G(2), S(1), E, H	Rubber boots, other unknown
2	1995	Cauliflower	Oxyfluorfen (24 hours)	<1	Entered field eight hours after application to lay pipe. Foreman had forgotten to tell him to wait until later in day for REI to expire. Symptoms: headache, throat irritation	Yes	No	C(1), G(2), S(1), E, H	Unknown ⁵
3	1995	Corn	Diazinon, Esfenvalerate (12 hours)	3	Entered field four hours after application, substantial contact with treated surfaces, not trained, no hazard communication, notified of application but not of restrictions on early entry. Symptoms: nausea and vomiting	Yes	No	C(1), G(1), E	Unknown ⁵
4	1995	Cotton	Methamidophos (72 hours, posting required)	4	Entered unposted field three hours after application. Foreman removed irrigator when applicator notified him of the application completion. Symptoms: headache, shortness of breath, shakes	No	No	C(1), G(2), S(1), E, H	Unknown ⁵
5	1995	Cotton	Bifenthrin (12 hours)	4	Details of exposure unknown. Symptom: rash	No	Yes	C, G(2), S	Unknown ⁵
6	1995	Grapes	Propargite (30 days, posting required)	11	Three irrigators entered posted vineyard 24 days after pesticide application. Symptoms: rash	No	Yes	C, G(1), S, H	No gloves, other unknown
7	1995	Tomatoes	Dimethoate (Spray has dried, dust has settled)	1.5	Entered field 40 minutes after application. Application was originally scheduled for two days earlier, applicator changed date without informing grower. Symptoms: headache, nausea, eye irritation	Yes	No	Unknown (1993 label)	Unknown ⁵

Table 3(continued): 1995–2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators,
Classified as Early Entry, with Details from Investigative Report

Line Number	Year	Crop	Pesticide (REI ² , Posting ³)	Hours Spent in Field	Description of Exposure	Worker Interviewed?	Worker Notified?	Label Required ppe ⁴	PPE/Clothing Worn by Irrigator(s)
8	1995	Tomatoes	Endosulfan (48 hours)	4	Irrigator entered posted field to move pipes 24 hours after a pesticide application. Symptom: rash	Yes	Yes	C, G(1), S, H	Leather gloves
9	1996	Alfalfa seed	Propargite (21 days, posting required)	N/D ⁶	Field had been treated and posted 15 days prior to irrigator entering. Symptom: rash	Yes	Yes	C, G(2), S, E, H	C, G(2), S, E, H
10	1996	Citrus	Chlorpyrifos (24 hours)	N/D ⁶	Supervisor assumed that irrigator saw application take place so did not notify him. Symptoms: headache, swollen lips and tongue	Yes	No	C(1), G(2), S, E, H	Long sleeved shirt and long pants
11	1996	Cotton	Acephate, Fenpropathrin, Oxyfluorfen (24 hours)	4	Worked in one field during an application, entered a second field during an REI. Symptoms: headache, nausea	Yes	No	C, G(2), S, E	No PPE provided or worn
12	1996	Cotton	Mepiquat chloride, Propargite (7 days, posting required)	4	Three irrigators entered posted field two days after application. They were notified of the application but not of the need for PPE. Symptom: rash	Yes	No	C, G(2), S, E, H	Long sleeved shirt, long pants, shoes and socks, hat
13	1996	Cotton	Chlorpyrifos, Esfenvalerate, Naled (24 hours)	<7	Irrigator worked on the periphery of two treated fields beginning 2½ hours after the pesticide application was complete. Unknown if he entered field. Symptoms: headache and stomach ache	Yes	Yes	C(2), G(2), S(1), E, H	C(2), G(2), S(1)
14	1996	Grapes	Propargite (30 days, posting required)	2.5	Irrigator entered posted vineyard one day after application to shovel some soil, had some contact with treated surfaces. Symptom: rash	Yes	Yes	C, G(1), S, E	Long sleeved shirt, long pants, shoes and socks, hat

Table 3 (continued): 1995–2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators,
Classified as Early Entry, with Details from Investigative Report

Line Number	Year	Crop	Pesticide (REI ² , Posting ³)	Hours Spent in Field	Description of Exposure	Worker Interviewed?	Worker Notified?	Label Required PPE ⁴	PPE/Clothing Worn by Irrigator(s)
15	1996	Onions	Chlorothalonil (48 hours)	2	Two workers entered field 39 hours after application. They knew the field had been treated but did not know when REI would expire. Symptoms: nausea and vomiting	Yes	No	C, G(1), S, E	Unknown ⁵
16	1996	Tomatoes	Methamidophos, Sulfur (72 hours, posting required)	0.5	Due to miscommunication between PCA and applicator, pesticide was not applied when originally scheduled. Two irrigators entered unposted field 2½ hours after application. Symptoms: headache, dizziness, rash.	Yes	No	C(1), G(2), S(1), E, H	Long sleeved shirt, long pants, leather boots
17	1997	Almonds	Bacillus Thuringiensis, Myclobutanil (12 hours)	0.5	Two irrigators were directed to enter a field one hour after a pesticide application. Symptoms: bronchitis	Yes	No	C, G(1), S, E, H	Unknown ⁵
18	1997	Wheat	Bromoxynil (12 hours)	N/D ⁶	Two irrigators were sprayed by an aerial application. They went home, showered, changed, and returned to work in the treated field. Symptoms: nausea, vomiting, itching	Yes	No	C(2), G(2), S(1), E, H	Unknown ⁵
19	1998	Corn	Propargite (7 days, posting required)	3	Irrigator entered posted field one week after pesticide application (a few hours before REI was to expire) and moved pipes in 3-foot tall corn – a high contact activity. Symptoms: nasal and oral irritation, nausea	Yes	Yes	C(2), G(2), S(1), E, H	Work clothes, hat
20	1998	Spinach	Bacillus Thuringiensis, Fosetyl-al, Imidacloprid, Permethrin, Tebufenozide (12 hours)	1	Four irrigators were directed to enter a field seven hours after a pesticide application. Pesticide was applied twelve hours later than originally scheduled. Posted as required by Monterey County regulation. Symptoms: headache, nausea	Yes	No	C, G(1), S, E	Unknown ⁵

Table 3 (continued): 1995–2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators,
Classified as Early Entry, with Details from Investigative Report

Line Number	Year	Crop	Pesticide (REI ² , Posting ³)	Hours Spent in Field	Description of Exposure	Worker Interviewed?	Worker Notified?	Label Required PPE ⁴	PPE/Clothing Worn by Irrigator(s)
21	1999	Greenhouse vegetables	Copper hydroxide, Piperonyl butoxide, Pyrethrin (24 hours)	2.5	Irrigator entered a posted greenhouse 1½ hours before expiration of REI and remained in the greenhouse for 2½ hours. Symptoms: nausea	No	Yes	C, G(1), S, E	Work clothes and rubber boots
22	1999	Onions	Cypermethrin (12 hours)	4	Irrigator entered field eight hours after application. Symptoms: headache, fatigue	Yes	No	C(1), G(2), S, E	C(1), G(2), S
23	2000	Corn	Propargite (7 days, posting required)	N/D ⁶	Irrigator was in field when application started, was sprayed twice. He went home, showered, returned to work, and reentered the unposted, treated field. Symptoms: sore throat	Yes	No	C(2), G(2), S(1), E, H	Long sleeved shirt, long pants, hat
24	2000	Lettuce	Dimethoate, Maneb, Methomyl, Permethrin (48 hours)	2.5	Irrigator was directed to irrigate treated field from periphery one hour after a pesticide application. He stated that he had to enter the field because some of the valves were hard to open. Posted according to Monterey County regulations. Symptoms: sore throat, dizziness, headache	Yes	No	C(2), G(1), S, E	Work clothes, one chemical resistant glove
25	2000	Tomatoes	Endosulfan, Methomyl (48 hours)	11.5	Irrigator entered field 38 hours after pesticide application. Symptoms: difficulty breathing and walking	Yes	No	C, G(1), S, E, H	Unknown ⁵
26	2000	Tomatoes	Copper ammonium hydroxide, Mancozeb (24 hours)	N/D ⁶	Irrigator entered field four hours after pesticide application. Symptoms: sore throat, nausea	Yes	No	C(2), G(2), S	Unknown ⁵

¹California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

²All pesticides listed for a specific episode were applied at the same time. The restricted entry interval (REI) listed is the longest applicable.

³Posting is noted only if required by pesticide product labeling

⁴Personal Protective Equipment (PPE) abbreviations

C - Coveralls

C(1) - Coveralls over short sleeved shirt and short pants

C(2) - Coveralls over long sleeved shirt and long pants

Ch - Chemical resistant suit

⁵ Unknown means that clothing was not itemized in the investigation report, so it is assumed that no required PPE was worn.

⁶ Information not included in illness investigation.

E -protective eyewear

G - gloves

G(1) - waterproof gloves

G(2) - chemical resistant gloves

H - chemical resistant headgear for overhead exposure

S - shoes and socks

S(1) – chemical resistant footwear plus socks

Other Episodes

A total of 62 episodes were ascribed to causes other than *entering* a field during an REI. These 62 episodes were categorized as follows: twelve episodes in which irrigators worked only on the periphery of treated fields and did not enter the field (in five of these episodes an REI was in effect, but activity could not be categorized as early entry since workers did not enter the treated field), eight episodes involved an application to a field other than the one in which the irrigator was working but did not involve drift, four were categorized as ‘accidental’, twenty-five episodes involved irrigators who entered fields after the expiration of an REI, five episodes were attributed to drift, and eight episodes occurred when an application took place while the irrigators were in the field.

In 12 of the 62 episodes the irrigator(s) did not enter the field and/or contact foliage. An episode was included in this category only if the irrigator was interviewed during the investigation and explicitly stated that he had not entered the field. When using furrow or flood irrigation, it may not be necessary for an irrigator to enter the field. However, the irrigator may contact treated surfaces if the irrigation equipment (pipes, socks, etc.) was in the area while the application was taking place. In Table 4, these 12 episodes are analyzed for specific irrigation task, crop, pesticide information, and symptoms experienced by the irrigator. All of the episodes through 1999 were classified as ‘possibly’ related to a pesticide exposure (data not shown). The episode in 2000 (propargite on grapes) was classified as probably related. An REI was still in effect at the time of exposure for the first five episodes in the table and the irrigators involved in three of these episodes reported more severe symptoms than any of the irrigators who reported working on the periphery of treated fields after the REI had expired. In the remaining seven episodes the REI had expired anywhere from two to seventeen days prior to the date of the exposure. A rash was the most common symptom reported by the irrigator(s) (8 of the 12 episodes). Irrigators were working on the periphery of cotton fields in six of the episodes and grapes in three episodes.

Table 4: 1995-2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators, In Which Irrigators Worked Only on the Periphery of Treated Fields¹

Year	Crop	Irrigation Task	Pesticide			Symptoms
			Name	Applied	REI ²	
1995	Cotton	Furrow	Cypermethrin, Imidacloprid, Mepiquat chloride	Previous night	12 hours	Rash on lower back
1995	Cotton	Furrow	Imidacloprid, Profenofos	1 day previous	72 hours	Rash (intermittent for 2 months)
1996	Grapes	Adjusting valves	Propargite	3 days previous	30 days	Vomiting
2000	Almonds	Filling in a hole	Azoxystrobin, Chlorpyrifos	Same day or previous day	24 hours	Dizziness and vomiting
2000	Grapes	Flood	Propargite, Fenarimol, Tebufenofos	14 days previous	30 days	Vomiting and chest pains

1995	Cotton	Furrow	Unknown	N/A	N/A	Rash (intermittent for 2 years)
1995	Cotton	Flood	Chlorpyrifos, Naled	16 days previous	24 hours	Rash on hands
1995	Cotton	Flood	Prometryn	13 days previous	12 hours	Rash on legs and stomach
1996	Tomatoes	Moving irrigation socks	Sulfur	5 days previous	24 hours	Eye irritation (irrigator rubbed his eye after handling irrigation socks)
1996	Grapes	Flood	Myclobutanil	6 days previous	24 hours	Rash on arms
1998	Cotton	Unknown	Pyrithiobac-sodium	18 days previous	24 hours	Rash and dizziness
1999	Almonds	Flushing lines	Azoxystrobin	3 days previous	12 hours	Rash

¹California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

²If more than one pesticide is listed; the restricted entry interval (REI) given is the longest applicable. The REI was still in effect for the five episodes in the upper portion of the table. Since the irrigators reported working only on the periphery of the field, these incidents cannot be classified as early entry. The REI had expired in the seven episodes reported in the lower portion of the table.

In eight episodes, irrigators entered fields to work but their exposure resulted from an application to a field other than the one they were working in, and was not a drift exposure. These data are presented in Table 5. The irrigator was interviewed during the illness investigation in all but the

1995 and 1997 episodes. In none of these episodes was actual contact with a pesticide alleged, and all eight episodes were classified as possibly related to a pesticide exposure (data not shown). Since the irrigators did not enter the treated field in question in any of these episodes, crops are not included in this table. In six of the episodes, the irrigator became ill due to the odor of the pesticide. In one episode involving a metam-sodium application to an adjacent field, the irrigator's symptoms were consistent with heat stress, and in the remaining episode involving a malathion application, the irrigator's symptoms were likely caused by a viral illness according to the physician. It is unknown whether the irrigators in the 1998 metam-sodium application episode were notified of the application. However, when the one irrigator who experienced symptoms was interviewed, he said he saw the handlers filling the application tank and also could see the application (soil injection) taking place in an adjacent field. For all the other post-1997 episodes, either the irrigator was notified of the application or the application took place at a distance greater than 1/4 mile.

Table 5: 1995-2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators, Associated with Application(s) to Fields Not Entered by the Irrigator^{1,2}

Year	Pesticide	Description
1995 ³	Chlorpyrifos Profenofos	An irrigator became ill due to odor of pesticides used on adjacent field. The application occurred one day before (48 hour REI)
1996	Unknown	An irrigator said he became nauseous from the odor of an aerial application taking place ~1/2 mile away, but also stated that his wife had the same symptoms.
1997 ³	Disulfoton	Irrigator experienced nausea and headache from the odor of an aerial application taking place ~1/2 mile away to a field owned by a different grower. Operator of property stated that he notified the irrigator of the application.
1998	Malathion	A worker was weeding and irrigating in a field adjacent to an application. According to the physician, the symptoms (nausea, cramps) were likely caused by a viral illness.
1998	Metam-sodium	One irrigator in a crew of four developed symptoms. The field in which he was working had been treated with metam-sodium two days before. The irrigators entered two hours after expiration of the REI. A soil injection of metam-sodium was taking place in an adjacent field.
1998	Hexythiazox	An irrigator developed a headache from the odor of an application ~1/2 mile away. He had been notified.
2000	Chlorpyrifos	An irrigator became nauseated from odor of pesticide application taking place at an unknown distance. Unknown if he was notified.
2000	Propiconazole	Odor of fungicide application ~1/4 mile away caused irrigator to vomit and have chest pains. Application schedule was posted at a central shop where the irrigators met every morning.

¹California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

²Drift incidents not included in this table

³Worker not interviewed

Table 6 provides a description of the four episodes that were categorized as ‘accidental’. Two of the three irrigator episodes classified as definitely related to a pesticide exposure are in this table.

Table 6: Pesticide-Related Injury/Illness 1995-2000 Episodes Involving Irrigators, Categorized as ‘Accidental’^{1,2}

Year	Relationship	Pesticide	Description
1996	Possible	EPTC	A pesticide had been added to water in an irrigation ditch. An irrigator fell in the ditch.
1996	Definite	Metalaxyl	An irrigator standing close to an idle applicator rig was sprayed when a hose broke
1997	Definite	Metam sodium	A handler picked up a hose and accidentally splashed 2 drops of pesticide in irrigator’s eye
1999	Probable	Metam sodium	A leaky valve allowed irrigation water from a treated field to leak into adjacent system. When the irrigator opened a valve, pesticide and water sprayed in his face.

¹California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

²None of the episodes placed in this category involved violations of either label or regulatory pesticide safety rules, and all were unexpected and unforeseeable events.

The five episodes that were drift-related are included for the sake of completeness (see Table 7 below). Since there were only five drift incidents involving irrigators during this six-year period, no conclusions can be drawn from these data. There were no drift incidents involving irrigators in 1997, 1999, or 2000.

Table 7: Pesticide-Related Injury/Illness 1995-2000 Episodes Involving Irrigators, Categorized as Drift Related

Year	Pesticide	Relationship	Description
1995	Unknown	Possible	The worker could not be located to be interviewed. According to his supervisor, the worker claimed that he might have been drifted on from an aerial application. The closest aerial application listed in the pesticide use report was two miles distant.
1995	Unknown	Probable	An irrigator developed a rash and reported it to his supervisor. He thought he might have been sprayed by an aerial applicator approximately seven days earlier, but was unsure of the date.
1995	Carbaryl	Possible	The irrigator was not interviewed during the investigation. He went to the doctor three days after he thought he had been drifted on. The application in question was to an adjacent field owned by a different grower.
1996	Sulfur	Definite	An aerial application to an adjacent field owned by a different grower resulted in a drift exposure to an irrigator
1998	Sulfur	Possible	An irrigator was working in a tomato field ~1/4–1/2 mile from an aerial application to a field owned by the same grower.

California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

There were seven episodes from 1995-2000 where irrigators were actually working in the field during an application, and one episode where workers were in a greenhouse during an application (see Table 8). All of the episodes, with the exception of the last episode in 1998 could have been prevented if the responsible parties had complied with existing regulations for notification and training. The irrigators in both 1995 episodes had not been notified of the scheduled application. In the 1996 episode, the operator of the property thought the application had been completed the previous day (had not received the notice of completion). Both the 1997 episode and the second 1998 episode illustrate what can happen when workers are improperly trained. In the 1997 episode the applicators and the irrigators saw each other but both continued working in the same orchard. Had the applicators been properly trained, they would have known not to apply a pesticide while workers were in the field. Had the irrigators been properly trained, they would have known to leave the area during an application. In the 1998 episode the foreman gave the workers an incorrect notification when he instructed them to leave the orchard when they heard the helicopter. By the time the workers could hear the helicopter the application had already begun. The last episode listed for 1998 was a result of a misunderstanding on the part of the irrigator.

Table 8: 1995-2000 Pesticide-Related Injury/Illness Episodes Involving Irrigator, Where Irrigators Were in the Field or Greenhouse During the Application

Year	Relationship	Description
1995	Probable	An irrigator was checking water in a tomato field while it was still dark. An aerial application began while he was in the field. He had not been notified.
1995	Probable	An irrigator was working in a sugar beet field when an aerial application of sulfur began. He had not been notified. Applicator did not see irrigator.
1996	Probable	The operator of the property thought the application had been completed the previous day and sent an irrigator into a cotton field. Soon afterwards an aerial applicator who did not see the irrigator began to apply sulfur.
1997	Probable	Three irrigators were working in an almond orchard when a ground application began. They saw the applicators, and the applicators saw them. Both crews continued working in the orchard.
1998	Probable	Two irrigators were working in a tomato field when an aerial application began. They said they were not notified of the application, but their supervisor said they were.
1998	Possible	A foreman knew an aerial application was scheduled and told four irrigators to leave the orchard when they heard the helicopter. As they were leaving the orchard, one irrigator may have been exposed to pesticide from the application.
1998	Possible	An irrigator said he misunderstood instructions and entered a celery field while a chemigation was in progress.
2000	Probable	Three greenhouse workers sought medical attention after working in an area where a fourth employee was applying mancozeb. One of the workers may have been within 10 feet of the application. 3CCR, Section 6772(c)(2)(B), defines the prohibited area as "the treatment site plus 25 feet in all directions within the enclosed area." The applicator failed to verbally notify the workers, but did post the bench area he was spraying.

California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

The remaining 24 episodes, all classified as ‘possibly’ related to a pesticide exposure, are examined in Table 9. Cotton and oranges were crops identified in five episodes each. Grapes and tomatoes were each identified in two episodes. All the other crops were identified with one episode each. The time elapsed between the REI expiration and the worker entering the field ranged from seven hours to 40 days. A rash was the symptom most commonly reported (14 out of these 24 episodes). No particular crop/chemical combinations can be identified as more than twenty-seven different pesticides were used on the 17 different crops.

Table 9: 1995-2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators, Where Irrigators Entered Field After REI Expired¹

Year	Crop	Pesticide (REI) ²	Time between Application and Irrigator Entering Field	Description	Symptoms
1995	Garlic	Oxyfluorfen (24 hours)	10 days	Entered field to check sprinkler lines. Garlic was about 2½ feet high. Went to doctor five days later.	Rash on legs
1995	Walnuts, Tomatoes	Chlorpyrifos, Copper Hydroxide (24 hours)	1 day	Irrigator not interviewed, moved pipes from tomato field to walnut orchard one day after application to orchard. Pesticide history of tomato field unknown. Went to doctor four days later	Runny nose, burning sensation in nose and throat
1995	Lettuce	Cypermethrin, Diazinon, Dimethoate (48 hours)	5 days	Irrigator moved pipes for furrow irrigation. He thought his hand had a burning sensation after touching lettuce plant. He rubbed his nose, and fifteen minutes later his nose began to itch. He went to the doctor four days later.	Nasal congestion
1995	Oranges	Methidathion (14 days for maximum application rate)	15 days	Details unclear. Irrigator stated he was working in an orchard that been treated with methidathion. His dates do not match with the employment/pesticide application record. He went to doctor three days later.	Headache and fatigue
1995	Garbanzo beans	Chlorothalonil (48 hours)	1 month	Investigated 8 months after incident. Worker not interviewed, had been moving lines for 3-4 days. Garbanzo beans are a noted skin irritant.	Rash on legs
1996	Cotton	Amitraz, Imidacloprid, Mepiquat chloride (24 hours)	22 days	Surrounding fields all treated with chlorpyrifos and dimethoate within the previous two days. Doctor said symptoms indicated viral upper respiratory infection	Vomiting
1996	Cotton	Abamectin (12 hours)	31 days	Irrigator not interviewed, worked in same field throughout season, moving lines.	Rash began on ankles, spread over legs
1996	Alfalfa	Trifluralin (12 hours)	40 days	Irrigator, wearing a long sleeved shirt while moving sprinkler lines, thought heat and sweat might have caused rash.	Rash on arms
1997	Tomatoes	Sulfur (24 hours)	2 days	Went to doctor eight days after irrigating in field.	Rash started on soles of feet, spread over body

Table 9 (continued): 1995-2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators,
Where Irrigators Entered Field After REI Expired

Year	Crop	Pesticide (REI) ²	Time between Application and Irrigator Entering Field	Description	Symptoms
1997	Potatoes	Esfenvalerate, Mancozeb (24 hours)	11 days	Irrigator reported dizziness, headache and fever to his supervisor the morning following a day spent irrigating. No other crew members were affected.	Dizziness and headache
1997	Cotton	Amitraz, Imidacloprid, Oxamyl (48 hours)	13 days	Furrow irrigating 3½-foot tall cotton, wearing coveralls and rubber gloves.	Rash over body
1997	Sugar beets	Unknown	Unknown	Investigated 12 months+ after incident (confusion as to which county had jurisdiction). Worker not interviewed.	Rash
1997	Oranges	Chlorpyrifos (24 hours)	4 days	Became nauseated from odor of pesticide.	Nausea
1997	Various	Various	Unknown	Irrigator worked in several plots (asparagus, corn, vegetable, turfgrass, alfalfa, citrus) on same day, thought itching began while working next to a field treated with dazomet 48+ hours before (24 hour REI)	Itching on legs, arms, hands, and face
1998	Oranges	Cyfluthrin (12 hours)	6 days	Irrigator went to doctor four days after rash began, did not wear available gloves, stated his hands were in constant contact with water.	Rash on hands, spread over body
1998	Tomatoes	Cuprous oxide (48 hours)	4 days	Four irrigators entered field, only one complained of symptoms. Worker not interviewed.	Blisters on hands, swollen lips
1998	Oranges	Pyriproxyfen, Petroleum Oil (12 hours)	2 days	Investigated 5 months after incident and worker not interviewed. Irrigator was checking sprinkler lines.	Sweating and vomiting
1998	Grapes	Bt, Dicofol, Sulfur, Triflumizole (24 hours)	4 days	Irrigator working on hot day, wearing Tyvek and sweatshirt with a hood. Physician said symptoms could have been caused by heat stress.	Dizziness and nausea
1998	Oranges	Chlorpyrifos (24 hours)	39 days	Adjusting and unplugging sprinkler lines, went to doctor 15 days after rash started.	Rash on hands

Table 9 (continued): 1995-2000 Pesticide-Related Injury/Illness Episodes Involving Irrigators,
Where Irrigators Entered Field After REI Expired

Year	Crop	Pesticide (REI) ²	Time between Application and Irrigator Entering Field	Description	Symptoms
1998	Broccoli	Dimethoate, Esfenvalerate, Oxydemeton-methyl (3 days)	3+ days	An irrigator entered a field seven hours after REI expired to move pipe out of the way for a fertilizer rig. He could smell an odor in the field.	Headache and nausea
1998	Corn	Propargite (7 days)	16 days	An irrigator had been monitoring flood irrigation in corn fields for five days, did not have contact with foliage.	Rash on hands and forearms
1998	Cotton	Chlorpyrifos (24 hours)	18 days	Investigated one year after incident. Employer and employee had little recollection of the incident. Employee reported rash three days after irrigating in two fields.	Rash
1999	Grapes	Various	Unknown	Investigated seven months after incident, worker not interviewed. He irrigated in several blocks. Incident occurred in May when vine growth was limited. Different blocks had been treated with a variety of pesticides; the most recent was five days previous to incident (24 hour REI).	Rash around waistline
2000	Cotton	Abamectin, Bifenthrin, Mepiquat chloride (24 hours)	2 days	Irrigator moving pipe	Rash began on soles of feet, spread over body

¹California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query

²All pesticides listed for a specific episode were applied at the same time. The restricted entry interval (REI) listed is the longest applicable.

Discussion

Results of WH&S's assessment of irrigator's pesticide-related illness/injuries indicate reasons for both optimism and concern. It is encouraging to note that, with the exception of 1998, the rate of pesticide-related injuries/illnesses in early entry episodes involving irrigators has shown an overall decline since 1995. This decline mirrors the decline in the total number of pesticide-related illness/injuries reported to the State in the past five years. Beginning in 1996, the total number of pesticide-related illness/injury reports for fieldworkers has decreased every year. In 1996 there were 479 fieldworker cases categorized as either definitely, probably or possibly related to a pesticide exposure. By 2000, this number had decreased to 194. WH&S staff are attempting to determine if this decline is genuine or based on other factors such as worker's fear of reporting an illness, a change in the way insurance companies report these incidents, or a decline in the rate that physicians report. On the other hand, it is discouraging to report that non-compliance with notification and PPE requirements for irrigators performing early entry tasks remains a problem. If workers are not notified of a pesticide application, an REI, or the need for PPE, they have no way of knowing what precautionary measures they should take to protect themselves. Assessment of the pesticide-related illness/injury episodes included in this report showed that posting requirements are largely being complied with.

Although there were only eight episodes in the six-year period evaluated for this report where irrigators were actually working in the field or greenhouse during an application, these episodes illustrate the different situations that can develop in California's varied agricultural settings and the need for continued vigorous enforcement of existing worker protection regulations, specifically notification and training.

Because of either incomplete information and/or non-specific symptoms, 82% of the episodes identified as other than early entry were classified as only possibly related to a pesticide exposure, making it difficult to evaluate specific problems for these 62 episodes. The issue of incomplete information in pesticide episode investigative reports has already been addressed by WH&S, since staff have been aware of this problem for some time. In an evaluation completed in 2001, WH&S found that complete or required information was collected in 63% of the pesticide episode investigation reports examined (11). Subsequently, WH&S and the Enforcement Branch developed training materials to present to county staff on improving pesticide episode illness investigations. This training was offered at nine regional training sessions in 2002. When non-specific symptoms are reported, classifying pesticide-related illness/injury episodes as to degree of relationship to a pesticide exposure presents a challenge to WH&S staff. Rash, a non-specific symptom, was reported in more than one third of the 62 non-early-entry episodes. The fact that irrigators often work in wet conditions day after day offers another explanation, in addition to pesticide exposure, for the rate of reported rashes among this population of workers. According to Held, *et. al.*, skin diseases make up as much as 30% of all occupational diseases which are eligible for compensation, and employees in wet occupations are at increased risk of developing irritant skin reactions (8). One of the more puzzling types of episodes involved irrigators working only on the periphery of fields, such as when performing flood or furrow irrigation. The irrigators in these episodes did not contact treated foliage, but the investigative reports indicated the possibility of pesticide exposure. A possible route of exposure

in these incidents may be through contact with irrigation equipment (pipes, socks, etc.) if the equipment was in the field at the time of the pesticide application.

Recommendations

Notification: Based on previous analysis of PISP data, WH&S has already identified areas of concern with certain sections of current regulations (10), and is in the process of drafting changes to address these concerns. Specifically, WH&S is proposing changes to sections dealing with notification (3 CCR, Sections 6618 and 6619), posting (3 CCR, Section 6776), and requirements for early entry workers (3 CCR, Section 6771). As part of this process, WH&S staff have relied upon input from worker advocates and CACs, and have met with grower and commercial applicator groups throughout California. In addition, DPR's Enforcement Branch amended its fieldworker inspection form in 2003 to include evaluation of compliance with notification requirements and CACs are including this as a focused activity in their 2003/2004 negotiated workplans with DPR. WH&S should place special emphasis on evaluating PISP investigative reports involving early entry violations to ascertain the level of compliance with notification requirements. If necessary, WH&S will work with Enforcement to offer training to county agricultural commissioner's staff emphasizing the importance of complying with notification requirements.

Personal Protective Equipment: DPR and CACs should conduct focused training on the requirements for PPE for early entry tasks. WH&S should continue to monitor PISP data for early entry workers to assess compliance with PPE requirements and to look for other specific trends that could be addressed through additional training or regulatory changes. WH&S will add early entry irrigators to the 2003 WH&S illness investigation priority list.

References:

1. Spencer, Janet R. (2001) Analysis of the Impact of the Federal Worker Protection Standard and Recommendations for Improving California's Worker Protection Program Regarding Field Posting (HS-1819). California Department of Pesticide Regulation, Worker Health and Safety Branch, 1001 I Street, Sacramento, California 95814
2. Mehler, L. (2002) Case Reports Received by the California Pesticide Illness Surveillance Program, 1995-2000, in Which Health Effects on Agricultural Workers Were Definitely, Probably, or Possibly Attributed to Exposure to Pesticides Used for Agricultural Purposes. California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query, Worker Health and Safety Branch, 1001 I Street, Sacramento, California 95814
3. California Food and Agriculture Code, Office of Administrative Law. Available on the web at: www.oal.ca.gov (accessed September, 2002)
4. Office of the Federal Register (1999) Title 40 Code of Federal Regulations (CFR), Parts 156 and 170. National Archives and Records Administration, US Government Printing Office, Washington, D.C. 20402-9328
5. California Department of Pesticide Regulation (1998) Title 3, Division 6, California Code of Regulations, California Department of Pesticide Regulation, 1001 I Street, Sacramento, California 95814
6. California Department of Pesticide Regulation (1996) WPS Rulemaking File WHS-96-1127-05, Vol. 1. Registration Library, 1001 I Street, Sacramento, California 95814
7. Orr, K. (2002) Case Reports Received by the California Pesticide Illness Surveillance Program, 1995-2000, in Which Health Effects on Irrigators Were Definitely, Probably, or Possibly Attributed to Pesticide Exposure. California Department of Pesticide Regulation, Pesticide Illness Surveillance Program database query, Worker Health and Safety Branch, 1001 I Street, Sacramento, California 95814
8. Held, E, Mygind, K., Wolff, C., Gyntelberg, F., Agner, T. (2002) Prevention of Work Related Skin Problems: An Intervention Study in Wet Work Employees. Occupational & Environmental Medicine 59: 556-561
9. California Department of Pesticide Regulation (2002) Pesticide Illness Surveillance Program (PISP) Database User Documentation/Dictionary http://www.cdpr.ca.gov/docs/dprdocs/pisp/data_dictionary.pdf; accessed August 20-21

10. McCarthy, Susan A. (2002) Analysis of the Hazard Communication, Notification and Retaliation Requirements of the Worker Protection Standard and Recommendations for Improving California's Worker Protection Program California Department of Pesticide Regulation, (HS-1833) Worker Health and Safety Branch, 1001 I Street, Sacramento, California 95814
11. Edmiston, S., Mehler, L., Verder-Carlos, M., Richmond, D., Orr, K., Boers, G. (2001) Evaluation of Pesticide Episode Investigation Reports, 1999-2001, (HS-1823) Worker Health and Safety Branch, 1001 I Street, Sacramento, California 95814